

Subject: Discussion of SmarTire's Experience in Promoting the Maintenance of 'Proper' Tire Inflation Pressures

Since 1987, SmarTire Systems Inc. has specialized in developing 'direct measurement' tire monitoring solutions for passenger, commercial and industrial vehicle markets. Through years of research and development, the Company has developed a technology that is practical for both the Original Equipment and replacement vehicle markets. The company's technology, which features a near full-time sensing capability, can automatically alert a driver to irregularities in tire pressure and/or temperature while the vehicle is in motion. The interactive full function display also provides a convenient, fingertip means for the consumer to verify his/her tire pressures or temperatures from the comfort of the vehicle's cab. SmarTire is committed to pioneering tire-monitoring technologies for today's vehicle needs while also innovating new approaches to monitoring tire parameters for future motor vehicle applications.

Pneumatic tires perform several functions all of which are important to providing optimum safety and reliability to vehicles.

Functions and characteristics of tires:

- Support the vehicle's weight up to maximum vehicle speeds
- Provide traction for acceleration and deceleration on all road surfaces and conditions
- Provide directional control and stability
- Absorb road roughness and impacts
- Resist tread wear
- Provide low rolling resistance

Inflation pressure levels directly influence the entire range of tire operating parameters; therefore, any improvements to the consistency of maintaining pressure levels at those values recommended by vehicle and/or tire manufacturers will enhance overall tire performance and vehicle safety. The selection process, used by the vehicle manufacturers to homologate tires onto vehicles, introduces certain tire performance margins that can tolerate limited deviations from the recommended 'placard' tire pressure value(s). The value of this acceptable pressure deviation is influenced by the design / application of the vehicle, prevailing environmental conditions and generic tire characteristics. The consumer has no convenient way of knowing just how much load-carrying margin is available therefore it is best to always operate the vehicle with the tires inflated at or close to the manufacturer's recommended values.

Tire inflation pressures are constantly changing as a function of contained air temperature. Whether this temperature change is attributed to the environment or tire operation is irrelevant, the pressure values are normally changing and therefore a consumer has difficulty in maintaining a consistent "placard" inflation pressure value. It is not uncommon to have up to a 4-psi increase in tire inflation pressure due to ambient temperature changes, heat from direct sunlight or tire operation. Unfortunately, it is all too common for consumers to drive to a service station to have their tire pressures checked. Even in winter conditions, a five-mile drive to a service facility can produce a pressure buildup in radial ply passenger tires of 2 to 3 psi. Therefore, unless this buildup is added to the "placard" value, the tire pressures are being unknowingly being set to a lower pressure than the recommended value for the prevailing ambient condition.

Some vehicle manufacturers actually specify on their "placard" that tire pressures should be increased by four psi, over the placard value, if the tires are "hot". However "hot" is not adequately defined and the consumer is still encouraged to set his/her pressures only when the tires are cold. Each opportunity for the consumer to set tire pressures should be exploited and an augmented pressure value over the placard value would normally be preferable to deferred correction or no action at all because the tires are considered as 'hot' at the time that the pressures were checked. Perhaps, an additional notation on the vehicle's placard and in the Operator's Manual that instructs the motorist to arbitrarily add 2-psi to the placard pressure setting if the vehicle (equipped with radial ply tires) has been driven approximately two miles before setting the pressures or add 4 psi to the placard pressure setting if the vehicle has been continuously driven 25 miles or more. The current industry position, of setting a single fixed placard pressure at the prevailing ambient temperature (which is continually changing), results in considerable nuisance to the consumer who is conscientiously trying to keep his pressures at the placard setting. By recognizing that pressure build-up occurs quite predictably in radial tires and instructing the consumer to increase the placard pressure accordingly, vehicle manufacturers and the tire industry would appreciably reduce the incidence of tires being unknowingly set to levels under the placard recommendation and increase the safety margin with respect to the tire's ability to support the applied load.

The pressure and load capacity labeling on tires is confusing since it refers to test parameters used in the FMVSS 109 tire test. Irrespective of the disclaimer, consumers and tire service personnel often arbitrarily use this maximum pressure value as the "recommended" tire pressure value and do not follow the vehicle manufacturer's specification on the 'placard'. This action however can result in the tires being slightly over inflated for the application and this is normally preferable to under inflation when considering a tire's load carrying performance.

The current tire labeling is correct for its intended purpose; changes will only introduce more confusion. Therefore consumers and tire service technicians should be better instructed to locate a vehicle's recommended pressure levels elsewhere than on the sidewall of the tire.

Passenger vehicle loading ends up being a function of what a consumer can easily fit into his/her vehicle. Normally the rated axle capacity (GAWR) and the GVWR exceed the levels of loading that can be attained in passenger vehicles. Therefore any action to augment vehicle labeling or request a consumer to weigh the vehicle would not be very effective. The most important, consumer controlled, parameters effecting tire capacity are inflation pressure and vehicle speed. Increasing emphasis and awareness of the necessity to augment tire inflation pressures and moderate vehicle speed when high vehicle loading and/or ambient temperatures are present would be the most effective way to ensure optimum tire performance and life.

Direct sensing of both tire pressures and temperatures is available with today's wireless tire pressure sensing technology. These systems provide both the sensing definition and instant response necessary to be effective pressure maintenance tools rather than just reacting to "significant under inflation". With either Aftermarket or OEM versions of these sensing systems installed, the consumer can be automatically informed at the early stages of tire pressure loss, thus avoiding undue deterioration of the tire's structural integrity. Tire performance and life reflect the cumulative effect of the stresses imposed on the tire during its service life. By continuously maintaining tire pressures at

or near the levels defined by the vehicle manufacturer, the consumer will be assured of consistent vehicle and tire performance.

Consumers have historically demonstrated an inability to maintain consistent tire pressures in the four tire locations of a vehicle. To a large degree, this is due to the robustness of today's tires and the fact that satisfactory tire life and performance is normally achieved, in spite of inconsistent pressure maintenance. Consumers are expected to rapidly become dependent on a vehicle's Tire Pressure Monitoring System to signal a low-pressure problem instead of periodically, even if infrequently, checking pressures in the conventional way. Without adequate maintenance of a consistent base-line pressure, monitoring devices, that are not directly measuring tire inflation pressures, are unlikely to live up to consumers' expectations and dependence for the system to detect either under inflated or significantly under inflated tires in a timely fashion.

NHTSA and Industry have an opportunity, in the next few months, to recognize and rectify the issues causing consumer difficulty in consistently maintaining tire inflation pressures at the levels prescribed for the safe operation of both tires and vehicles. It is already apparent that there are several courses of action required for this to be successful but they all are dependent upon a better-informed consumer. Any initiative that provides the motorist with a timely automatic awareness to the presence of abnormal tire pressures is a step in the right direction. However, these onboard systems must also be supported by a better-informed vehicle and tire service industry that provides consistent action and advice to consumers that are in agreement with Industry recommendations.